METHOD, SYSTEM AND USER INTERFACE FOR INPUTTING AND
MANIPULATING TOKENISED STRINGS

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BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates generally to computer
generated documents and in particular to computer
generated index documents.

Description of Related Art

For many documents created on a computer, like text
documents, HTML documents, presentations and others,
related index pages are useful in finding desired content
within the document, or are useful in getting information
about bibliographic sources or the like. Index documents
include documents that in turn include any or all of a
table of contents, a headword index, figure or table
index as well as a bibliographic index, for example,
which are referred to herein as an index page.

Creating an index page involves a lot of formatting
work, and is therefore time consuming and costly. An
index page typically has a plurality of index lines
having a specific content and format. In an index page
that is a table of contents of a book, for example, there
exist index lines for different hierarchical levels of
headings, i.e., main heading, sub-heading etc.

Figure 1 shows an example of an index page 100 that
is a table of contents of a textbook. Index page 100 has

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a plurality of index lines, which have different
functions and are formatted differently.

The first index line is the title "Contents"
followed by the index line "Summary" with page number 5.
5 Next are three index lines representing hierarchies of
headings. A table of contents like that shown in
Figure 1 is an example of an index page, where the index
lines represent a different level in a hierarchical order
within the index page.

10 Another example is a bibliographic index, which can
contain a plurality of different types of information
sources like books, journals, theses, e-mails, www-pages
and so on. Different types of index lines, in this
example, do not represent different hierarchical levels,
15 but do represent different types of information sources.

It is known to define the content and format of an
index line using a string of instruction symbols (tokens)
and attributes associated with the tokens. In the
following an example of a token string with corresponding
20 attributes (in parenthesis) is provided for an index line
of a table of contents, such as that in Figure 1:

chapter number **CH** (character style); entry text **ET**
(style template); tabulator **TAB** (type, filling
25 character, position); page number **PN** (character
style).

Typically, "chapter number" is represented by a
numerical value, e.g., 1, 1.1, 1.3.5. "Entry text" is
30 the chapter title and has a style defined by the style
template.   The tabulator filling character, e.g., a
blank character or a dot, fills the space from the entry
text to the page number.   The tabulator has two other
attributes, i.e., the tabulator type (centred, left,
35 right) and a position measured in mm, inches or any other
suitable metric. In most cases, the page number is
positioned at the right side of the index line.

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It is known to either input the token string
directly by typing the instruction symbols and attribute
values, or by using a user interactive menu dialog.
These two methods are complicated and time consuming for
5   the user. Furthermore, the problem arises that the
syntax of tokens and attributes may be input incorrectly.
Arranging the tokens to define an order is
particularly difficult to handle because tokens could be
entered inside another token. Therefore, the computer
10   program has to check the syntax of the input token string
every time, and if the syntax is wrong, the token string
has to be corrected by the user. Besides index pages
other instruction sets, for example defining a modem
interface, may have to be input into a computer with
15   correct syntax.

SUMMARY OF THE INVENTION
According to the present invention, a method of
interactively generating a computer readable instruction
20   set having instruction symbols and related variables
comprises:
a) generating a signal for displaying a list of
selectable instruction symbols,
b) arranging a selected instruction symbol to form
25   part of the instruction set,
c) generating a signal for displaying a list of
selectable variable values, if at least one variable
relates to the selected instruction symbol,
d) arranging a selected variable value to form part
30   of the instruction set, and
e) repeating steps a) to d) until the instruction
set is completed.
The instruction set may preferably define a
formatted index document or database relating to another
35   arbitrary document type.
In another embodiment, a computer-based method of
interactively generating an index page displays a window

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including a list of index page types. Upon selection of
one index page type in the list of index page types, a
window including a list of index line types is displayed.

Upon selection of one index line type in the list of
5   index line types, a token string including a plurality of
tokens is displayed. The plurality of tokens includes
only tokens appropriate for the one index line. Upon
selection of one token, or alternatively a window for
entering content associated with the one token, user
10   selectable attributes for the content associated with the
at least one token are displayed.

In one embodiment, index line types in the list of
index line types represent different levels in a
hierarchical order within the index page, and the list of
15   index page types includes a table of contents. The list
of index page types also includes a bibliographic index,
and upon selection of the bibliographic index, the index
line types in the list of index line types represent
different sources of bibliographic information.

20   In one embodiment, the method of this invention is
implemented using a computer-based graphic user interface
comprising:

an insert index page dialogue window
comprising:

25   an index page type window wherein the
index page type window includes a list of index
page types; and the index page type window
displays at least one index page type in the
list of index page types;

30   an index page title window coupled to the
index page type wherein the index page title
window displays a title for the at least one
index page type;

an index line type window coupled to the
35   index page type window wherein the index line
type window includes a list of index line

types for the at least one index page type; and

a token string coupled to the index line type window wherein the token string includes a plurality of tokens and further wherein each token comprises an element in an index line type selected in the index line type window.

The method of this invention is also contained a computer program product for interactively generating an index page dialogue window. The computer program product includes program code adapted for:

displaying a window including a list of index page types;

displaying a window including a list of index line types upon selection of one index page type in the list of index page types;

displaying a token string including a plurality of tokens, upon selection of one index line type in the list of index line types, wherein the plurality of tokens includes only tokens appropriate for the one index line type; and

displaying, for at least one token in the plurality of tokens, user selectable attributes for data associated with the at least one token.

A system, according to this invention includes a processor and a memory coupled to the processor. Stored in the memory are computer instructions for a method of interactively generating an index page. Upon execution of the computer instructions on the processor, the method comprises:

displaying a window including a list of index page types;

displaying a window including a list of index line types upon selection of one index page type in the list of index page types;

displaying a token string including a plurality of tokens, upon selection of one

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index line type in the list of index line
types, wherein the plurality of tokens includes
only tokens appropriate for the one index line
type; and

5   displaying, for at least one token in the
plurality of tokens, user selectable attributes
for data associated with the at least one
token.

In more general terms, one embodiment of the
10   invention includes a user interface for inputting and
manipulating tokenised strings such as those found on an
index page. Furthermore, with this user interface,
syntax errors in such strings can effectively be avoided.

15   BRIEF DESCRIPTION OF THE DRAWINGS
Figure 1 is an illustrative example of a prior art
index page.
Figure 2 is a block diagram of a computer system
that includes the method of this invention.
20   Figure 3 is a schematic illustration showing an
exemplary dialog window displayed on a display screen
according to an embodiment of the present invention.
Figure 4 is a schematic illustration of a dialog
window displayed on a display screen according to another
25   embodiment of the present invention.
Figure 5 is a flow chart schematically illustrating
an embodiment of the present invention.
In the drawings and in the following detailed
description, elements with the same reference numeral are
30   the same element. Also, the first digit of a reference
numeral represents the number of the figure in which that
element first appeared.

DETAILED DESCRIPTION
35   A method 230 (Figs. 2 and 5), according to the
present invention, allows a user to easily and
conveniently generate each index line on an index page

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using a single user interface 295 that is displayed on
monitor 216 of a computer system 200. Not only does each
index line generated using interface 295 have a correct
syntax, but also, the user is not required to use
5   multiple different interfaces, e.g., a first interface to
generate the index line and a second interface to edit
portions of the index line.

Herein, an index page comprises a plurality of index
lines, which have different functions and are formatted
10   differently. An index page may include one or more
physical pages of a document.

Although, the phrase "index line" is used here, an
index line is not limited to a single line on the index
page. In the sense of the present embodiment, an index
15   line can actually comprise two or more physical lines of
text that form a paragraph.

Formatting using graphic user interface 295,
however, is carried out for every index line. An index
line is therefore to be understood as a formatting unit.
20   In most cases, like the example shown in Figure 1,
however, every index line is actually one text line.

As explained more completely below, user
interface 295 of this invention includes all controls
necessary for a user to easily generate each index line
25   in an index page. Moreover, for each index line, the
user is presented with a framework that is correct with
respect to the hierarchical location of the index line
within the index page, or with respect to the type of
index line within the index page. In particular, upon
30   selection of a particular type of index line, the user is
presented only with tokens and data entry fields that are
appropriate for the chosen type of index line.

No longer does the user have to worry about improper
nesting of tokens used in formatting the various elements
35   in an index line. In fact, unlike the prior art
described above, no prior knowledge of the tokens or of
attributes of the tokens is required, because the correct

tokens, preferably in the correct locations, are
presented in interface 295 for each element in the index
line level selected by this user. In addition, if there
are style or other attributes associated with a
5 particular token, the user accesses these attributes from
interface 295 and makes the desired selections. The user
is unconcerned with encoding the order or format used to
specify the attributes of a particular token.

Figure 3 is a more detailed diagram of one
10 embodiment of graphic user interface 295. As discussed
more completely below, graphic user interface 295
includes an index page dialogue window that in this
embodiment includes a plurality of windows that are used
to select and generate each index line in the index page.
15 Various buttons are used to expand some of the windows in
interface 295. In another embodiment, index page
dialogue window 295 includes a plurality of overlain
cards that each has a tab. When the user selects a
particular tab, that card is moved to the front of
20 window 295. The particular technique used to implement
the features of interface 295 of this invention are not
essential to the invention, and will vary depending upon
the characteristics of the computer system in which the
invention is used, and the methods used to implement the
25 invention in that computer system.

In one embodiment, to generate index page dialogue
window 295, the user first accesses an Insert icon in a
tool bar of an application in which the user wants to
create the index page. Upon accessing the Insert icon,
30 the user is presented with a menu that includes an entry
"Indexes." Upon selection of entry "Indexes," the user
is presented with yet another menu that includes
"Indexes," that the user in turn selects. In response to
this last selection, the user is presented with one
35 embodiment of graphic user interface 295, as illustrated
in Figure 3.

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In this embodiment of graphic user interface 295, the user can select a type of the index page of interest to the user using index page type window 301. In this embodiment, the index page type choices include:

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> Table of Contents
> Alphabetic Index
> Illustration Index
> Index of Tables
10   User-Defined
> Table of Objects
> Bibliography.

The user selects a particular type of index page by
15 clicking on button 308 and then selecting one type of index page from a list of index page types. Upon selection of the particular type of index page from this list, e.g., "Table of Contents" in Figure 3, a default title for that index page is entered in index page title
20 window 302. However, the user can replace the default title, by selecting title window 302 and inputting a new title. Figure 4 is another embodiment of graphic user interface 295B in which the user selected an index page type of "Bibliography" in index page type window 301, and
25 so the default title in title window 302 is "Bibliography".

Hence, in method 230 of this invention, display list of index page types operation 501 (Fig. 5) presents a list of index page types to the user upon activating
30 button 308 in index page type window 301 of graphic user interface 295. From the list displayed in operation 501, a user selects one index page type from the list, e.g., "Table of Contents" in Figure 3, and "Bibliography" in Figure 4, in select index page type operation 502.

35   Upon the user selecting a particular index page type from the list in operation 502, graphic user interface 295 presents a list of index line types

appropriate for the index page type selected in an index
line type window. In Figure 3, a list of hierarchical
levels for the "Table of Contents" are presented in index
line type window 306A that is labelled "Level" in this
5   embodiment. In Figure 4, a list of types of documents
that typically are used in a bibliography are presented
in index line type window 306B that is labelled "Doc.
Type." The types of index lines illustrated in Figures 3
and 4 are illustrative only and are not intended to limit
10   the invention to the specific types displayed. In view
of this disclosure, one of skill in the art can implement
index line types that are appropriate for each type of
index page.

In select index line type operation 504, the user
15   can select any desired index line type from those
displayed in the index line type window, e.g.,
windows 306A (Fig. 3) and 306B (Fig. 4). In the example
of Figure 3, the user selects level "1" for index line
type to be added to the Table of Contents in
20   operation 504. In the example of Figure 4, the user
selects "Book" in operation 504 for the type of index
line to add to the Bibliography.

Upon selection of a particular type of index line,
display token string operation 505 displays, in user
25   interface 295, a token string, e.g., token string 303A in
Figure 3 and token string 303B in Figure 4, for the
selected index line type. Specifically, in the example
of the table of contents as shown in Figure 3, four
tokens CH (chapter) 310A, ET (entry text) 312A, TAB
30   (tabulator) 314A and PN (page number) 316A are displayed.
Associated with each of tokens 310A, 312A, 314A and 316A
is a display field window 311A, 313A, 315A and 317A,
respectively.

The tokens in an index line are instruction symbols
35   for defining elements of the index line. Accordingly,
the particular tokens and associated display field
windows may be different for each index line of the index

page. However, in a given index line type, the string of tokens includes only tokens that are appropriate for elements in that type of index line type, e.g., tokens that represent each element in that type of index line
5   type.

By clicking on the respective display field window on the screen the user can then enter the corresponding content, e.g., "1.1.2" in window 311A for chapter token 310A, or "fluids" in window 313A for title
10   token 313A, in insert content operation 506. In one embodiment, not only is the content displayed in the window for the token, but also the entire index line is displayed in index page display window 325.

Typically, each token has a default style for the
15   information entered in the display field window for that token. However, in addition, upon selecting a token, display selectable attributes operation 507 displays attributes that the user can define or modify for the selected token.

20   For example, in one embodiment, for token ET (Fig. 3), the user could select, in select attributes operation 508, either template 1 or template 2 to define the attributes of the text entered. In another embodiment, the user can use style window 304A to select
25   a paragraph style associated with the index line represented by token string 303A in select attributes operation 508. If the user selected token TAB, the user can utilize tab window 305A to select the tab stop position and the fill character inserted between the
30   title and the page number in select attributes operation 508. Hence, in this embodiment, the attributes may include style templates, character styles selected in character style window 307A or 307B, or tabulator positions.

35   When a user selects either a particular token or a display field window for that token, only the attributes associated with the specific selection are enabled in

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window 295. Hence, for each token in an index line, only
attributes that can be selected for that token are
enabled in window 295 when that token is selected.
Therefore, the user can easily select appropriate
5   attributes for the element in the index line associated
with the token.

The selection of attributes is further restricted to
only valid values so that inputting of a token string
having an incorrect instruction syntax is not possible.
10   Similarly, the fields for inserting characters are only
enabled if a character at the respective position is
allowed.

Upon entering data for the selected token in
operation 506 and selecting any attributes for the
15   selected token in operation 508, all tokens check
operation 509 determines whether the user has processed
all the tokens in token string 303A. If all tokens have
been processed, check operation 509 transfers to last
index line check operation 510 and otherwise returns to
20   select token and insert content operation 506. If the
user has completed the index page, check operation 510
transfers to end and otherwise to select index line type
operation 504.

While check operations 509 and 510 are presented as
25   sequential operations in Figure 5, this is illustrative
only and is not intended to limit the invention to this
particular sequence of operations. As is known to those
of skill in the art, an event handler is associated with
a graphic user interface, and when an event occurs, the
30   event handler determines what instruction the user has
input, and branches to the appropriate action for that
instruction.

Returning to Figure 4, where index line type book
was chosen, token string 303B include tokens TIT
35   (title) 310B, AUT (author) 312B, YEA (year) 314B and ED
(editor) 316B that are displayed in operation 505 upon
selection of index line type book in operation 504. The

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user can now input title, author, year of publication,
editor etc in operations 506 to 508. Displayed
tokens 310B, 312B, 314B, and 316B are adapted to the
chosen document type so that all necessary information
5   can be input. In the case of a web page, for example, it
is possible to insert tokens for a hyperlink to the
referenced www-page. Also, notice that since token
string 303B does not include a tabulator token, tabulator
window 305B is greyed-out to indicate that this attribute
10   is unavailable.

The index page may be assigned to a document
presently opened in the computer or a defined portion
thereof as, for example, a chapter or paragraph. The
invention, however, is not restricted to the generation
15   of index pages. Other types of instruction sets may also
be created by the present invention. An example of such
an instruction set is an instruction string containing
AT-commands for a modem interface.

The interactive editing of the instruction set
20   speeds up the generation or editing of the instruction
set. In the case of a bibliographic index, for example,
the user may enter a short name for a field like the
author. If a corresponding entry does not exist in the
bibliographic index, the user can then click on a button
25   to create a new entry for the bibliography. The
interactive entry of instruction symbols and variables
furthermore can avoid the entry of instruction language
that is not permitted. As a user builds or edits an
index page, in one embodiment, the index page is
30   displayed in index page display window 325.

In one embodiment, graphic user interface 295 is
implemented using a hardware configuration like a
personal computer or workstation as illustrated
schematically in Figure 2 by computer system 200.
35   However, in another embodiment, graphic user
interface 295 is implemented using a client-server
configuration 250 that also is illustrated in Figure 2.

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Graphic user interface 295 may be displayed on a display
screen of client device 200 while some or all operations
of method 230 are carried out on a server computer 280
accessible by the client device 200 over a data
5 network 203 and 204, such as the Internet, using a
browser application or the like.

Herein, a computer program product comprises a
medium configured to store or transport computer readable
code for method 230 or in which computer readable code
10 for method 230 is stored. Some examples of computer
program products are CD-ROM discs, ROM cards, floppy
discs, magnetic tapes, computer hard drives, servers on a
network and signals transmitted over a network
representing computer readable program code.

15 As illustrated in Figure 2, this storage medium may
belong to computer system 200 itself. However, the
storage medium also may be removed from computer
system 200. For example, method 230 may be stored in
memory 284 that is physically located in a location
20 different from processor 201. The only requirement is
that processor 201 is coupled to the memory containing
method 230. This could be accomplished in a client-
server system 250, e.g., system 200 is the client and
system 280 is the server, or alternatively via a
25 connection to another computer via modems and analog
lines, or digital interfaces and a digital carrier line.

For example, memory 284 could be in a World Wide Web
portal, while display unit 216 and processor 201 are in a
personal digital assistant (PDA), or a wireless
30 telephone, for example. Conversely, the display unit and
at least one of the input devices could be in a client
computer, a wireless telephone, or a PDA, while the
memory and processor are part of a server computer on a
wide area network, a local area network, or the Internet.

35 More specifically, computer system 200, in one
embodiment, can be a portable computer, a workstation, a
two-way pager, a cellular telephone, a digital wireless

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telephone, a personal digital assistant, a server computer, an Internet appliance, or any other device that includes the components shown and that can execute method 230. Similarly, in another embodiment, computer

5 system 200 can be comprised of multiple different computers, wireless devices, cellular telephones, digital telephones, two-way pagers, or personal digital assistants, server computers, or any desired combination of these devices that are interconnected to perform

10 method 230 as described herein.

Herein, a computer memory refers to a volatile memory, a non-volatile memory, or a combination of the two in any one of these devices. Similarly, a computer input unit and a display unit refer to the features

15 providing the required functionality to input the information described herein, and to display the information described herein, respectively, in any one of the aforementioned or equivalent devices.

In view of this disclosure, method 230 can be

20 implemented in a wide variety of computer system configurations. In addition, method 230 could be stored as different modules in memories of different devices. For example, method 230 could initially be stored in a server computer 280, and then as necessary, a module of

25 method 230 could be transferred to a client device 200 and executed on client device 200. Consequently, part of method 230 would be executed on the server processor 282, and another part of method 230 would be executed on processor 201 of client device 200. In view of this

30 disclosure, those of skill in the art can implement the invention of a wide variety of physical hardware configurations using an operating system and computer programming language of interest to the user. For example, Figure 2 shows input devices 215 and 218, but

35 other input devices, such as speech recognition software and/or hardware could be used to input the selections and data for method 230.

In yet another embodiment, method 230 is stored in memory 284 of system 280. Stored method 230 is transferred, over network 204 to memory 211 in system 200. In this embodiment, network interface 283

5 and I/O interface 202 would include analog modems, digital modems, or a network interface card. If modems are used, network 204 includes a communications network, and method 230 is downloaded via the communications network.

10 Method 230 of the present invention may be implemented in a computer program including comprehensive office application STAROFFICE that is available from Sun Microsystems, Inc. of Palo Alto, CA. (STAROFFICE is a trademark of Sun Microsystems.) Such a computer program

15 may be stored on any common data carrier like, for example, a floppy disk or a compact disc (CD), as well as on any common computer system's storage facilities like hard disks. Therefore, another embodiment of the present invention also relates to a data carrier for storing a

20 computer program for carrying out the inventive method. Yet another embodiment of the present invention also relates to a method for using a computer system for carrying out the presented inventive method. Still another embodiment of the present invention further

25 relates to a computer system with a storage medium on which a computer program for carrying out the presented inventive method is stored.

While the invention has been particularly shown with reference to a preferred embodiment thereof, it will be

30 understood by those skilled in the art that various other changes in the form and details may be made therein without departing from the spirit and scope of the invention.